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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/965,509	09/26/2001	Cem Basceri	6047-59403	3307

7590 04/21/2004

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EXAMINER

THOMAS, TONIAE M

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 04/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/965,509

Applicant(s)

BASCERI ET AL.

Examiner

Toniae M. Thomas

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 November 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 30-50 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 30-42 is/are rejected.
- 7) ☒ Claim(s) 43-50 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 September 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This Office action is an official response to the amendment filed on 17 November 2003. Currently, claims 30-50 are pending.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. *Claims 30-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laibowitz et al. (US 5,926,360) in view of Kang (US 5,786,259).*

Regarding claims 30-33, 36, and 42

Laibowitz et al. disclose a capacitor structure (fig. 4 and col. 6, lines 8-31). The capacitor structure comprises the following elements: a support structure 40 (fig. 4); a conductive layer having a pitted surface 43 (fig. 4); a layer of dielectric material 44 disposed on the pitted surface (fig. 4); and a continuous layer of conductive material 46 disposed on the layer of dielectric material (fig. 4). The conductive layer 43 is formed on a first conductive layer 42. Together, the conductive layers form the lower electrode of a capacitor structure.

Laibowitz et al. teach that the conductive layer having the pitted surface may be selected from a material selected from one of Pt, Pd, Au, Ag, Rh, Re, Ir, Os, and Ru.

However, Laibowitz do not teach that the conductive layer having the pitted surface is a conductive metallic oxide layer or, more specifically, a ruthenium oxide layer.

Kang discloses a capacitor structure (figs. 10-18 and accompanying text). The capacitor structure comprises a first conductive layer 213 and a second conductive layer 215 (fig. 13). Together, the first and second conductive layers form the lower electrode of the capacitor structure. Kang teaches that the second conductive layer 213 of the lower electrode may be a conductive material selected from a Pt group metal, such as Pt, Ru, Ir; or a conductive material selected from an oxide of a Pt group metal, such as IrO_2 , RuO_2 , or OsO_2 (col. 5, line 58 – col. 6, line 13).

It would have been obvious to one having ordinary skill in the art, at the time the invention was made, to form the conductive layer 43 from an oxide of a Pt group metal (e.g. RuO_2) because, as Kang teaches, oxides of Pt group metals may be used in place of Pt group metals as the material used for lower electrodes in capacitor structures.

Regarding claims 37-41

Laibowitz et al. disclose a capacitor structure in an integrated circuit (fig. 4 and col. 6, lines 8-31). The structure comprises: a layer of conductive material 42 with islands 43 disposed thereon (fig. 4); a layer of dielectric material 44 disposed conformally on the islands (fig. 4). A layer of conductive material 46 is disposed conformally on the layer of dielectric material (fig. 4). Together, the layer of conductive material 42 and the islands 43 form the lower electrode of a capacitor structure.

Laibowitz et al. teach that the islands may be formed of a material selected from one of Pt, Pd, Au, Ag, Rh, Re, Ir, Os, and Ru. However, Laibowitz do not teach that the islands are formed of a conductive metallic oxide or, more specifically, a ruthenium oxide.

As discussed above, Kang discloses a capacitor structure (figs. 10-18 and accompanying text). The capacitor structure comprises a first conductive layer 213 and a second conductive layer 215 (fig. 13). Together, the first and second conductive layers form the lower electrode of the capacitor structure. Kang teaches that the second conductive layer 213 of the lower electrode may be a conductive material selected from a Pt group metal, such as Pt, Ru, Ir; or a conductive material selected from an oxide of a Pt group metal, such as IrO_2 , RuO_2 , or OsO_2 (col. 5, line 58 – col. 6, line 13).

It would have been obvious to one having ordinary skill in the art, at the time the invention was made, to form the islands 43 from an oxide of a Pt group metal (e.g. RuO_2) because, as Kang teaches, oxides of Pt group metals may be used in place of Pt group metals as the material for lower electrodes in capacitor structures.

Regarding claims 34 and 35

Laibowitz et al. do not teach that the pits have a mean diameter in the range of one to three times the thickness of the conductive layer, or that the pits in the surface have a mean closest distance that is at least two times a thickness of the layer of the dielectric material. However, it would have been obvious to one having ordinary skill in the art, at the time the invention was made to provide the pits with a mean diameter

in the range of one to three times the thickness of the conductive layer, and having a mean closest distance that is at least two times a thickness of the layer of the dielectric material, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art (In re Aller, 105 USPQ 233). Therefore, the mean diameter and mean closest distance of the pits is taken to be obvious over the combination of Laibowitz et al. and Kang.

Allowable Subject Matter

3. Claims 43-50 are allowable. The following is an examiner's statement of reasons for allowance: the prior art of record fails to anticipate, teach, or suggest either an enhanced-surface-area conductive structure or a capacitor structure in an integrated circuit substantially as claimed. For example, the prior art of record does not anticipate, teach, or suggest an enhanced-surface-area conductive structure, which comprises a conductive layer of ruthenium and ruthenium oxide such that a surface of the conductive layer has a plurality of pits situated at ruthenium phase zones in the conductive layer. In addition, the prior art of record fails to anticipate, teach, or suggest a capacitor structure, which comprises a layer of conductive metallic oxide having a surface that includes pits situated at metallic phase zones in the conductive metallic oxide layer.

Response to Arguments

4. Applicant's arguments filed 17 November 2003 have been fully considered but they are not persuasive.

5. The Applicant argues that Laibowitz does not teach a ruthenium oxide pitted surface, and that Kang does not teach a ruthenium oxide layer having a pitted surface. Laibowitz discloses a capacitor structure (fig. 4). The capacitor's lower electrode comprises a first layer - conductive layer 42, and a second layer - conductive islands 43. The conductive layer 42 and islands 43, combined, form a conductive layer having a pitted surface.¹

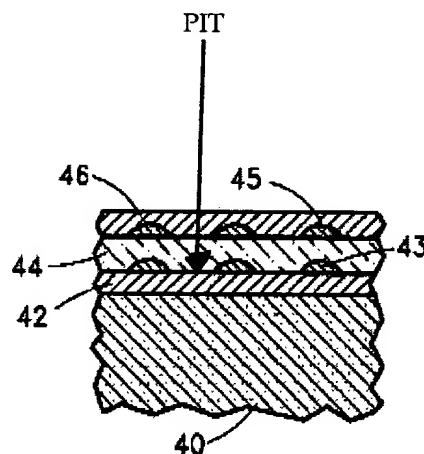


FIG.4

Whereas the conductive layer having a pitted surface comprises a metal layer such as Ru (col. 6, lines 22-26), Laibowitz does not teach that the conductive layer comprises

¹ Note that conductive layer 42 and islands 43 disclosed by Laibowitz resemble conductive layer 12 and islands 16, 20 shown in fig. 3 of Applicant's disclosure.

RuO₂. The Kang patent is relied upon only because it teaches that RuO₂ may be used in place of Ru as a material for a lower electrode in a capacitor structure of an integrated circuit. Kang need not teach a ruthenium oxide having a pitted surface, since the primary reference, Laibowitz, is relied upon for that teaching. It is the examiner's position that, combined, Laibowitz and Kang disclose a conductive layer comprising a ruthenium oxide layer having a pitted surface.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

7. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Toniae M. Thomas whose telephone number is (571) 272-1846. The examiner can normally be reached on Monday-Thursday from 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone numbers

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for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-1675.

JMJ

April 19, 2004



MARY WILCZEWSKI
PRIMARY EXAMINER
AU 2822